

Section 7. Total Energy

The preceding sections of this documentation describe how EIA arrives at State end-use consumption estimates by individual energy source in the State Energy Data System (SEDS). This section describes how all energy sources are added in Btu to create total energy consumption and end-use consumption estimates.

Total Energy Consumption

Total energy consumption by State is defined in SEDS as the sum of all energy sources consumed. The total includes all primary energy sources used directly by the energy-consuming sectors (residential, commercial, industrial, transportation, and electric power), as well as net interstate sales of electricity (ELISB) and net imports of electricity (ELNIB).

Energy sources can be categorized as renewable and non-renewable sources:

Non-Renewable Sources

Fossil fuels:

- coal (CL)
- net imports of coal coke (U.S. only)
- natural gas (NG) excluding supplemental gaseous fuels (SF) (NN = NG - SF)
- petroleum products (PA) excluding fuel ethanol blended into motor gasoline (EN) (PM = PA - EN)

Nuclear electric power (NU)

Renewable Sources

- fuel ethanol (EN)
- geothermal direct use energy and geothermal heat pumps (GE)
- conventional hydroelectric power (HY)
- solar thermal direct use energy, and photovoltaic electricity net generation (SO)

- electricity produced by wind (WY)
- wood and wood-derived fuels (WD)
- biomass waste (WS)

Total consumption of fossil fuels in billion Btu are calculated for each State and the United States as follows:

$$\begin{aligned}\text{FFTCBZZ} &= \text{CLTCBZZ} + \text{NNTCBZZ} + \text{PMTCBZZ} \\ \text{FFTCBUS} &= \text{CLTCBUS} + \text{CCNIBUS} + \text{NNTCBUS} + \text{PMTCBUS}\end{aligned}$$

The definition and calculation of the total consumption of each fossil fuel energy source is explained in Sections 2 through 4. Renewable energy total consumption (RETCB) is described in Section 5, and nuclear electric power (NUETB) is described in Section 6.

Total energy consumption in billion Btu for each State and the United States is calculated as follows:

$$\text{TETCBZZ} = \text{FFTCBZZ} + \text{NUETBZZ} + \text{RETCBZZ} + \text{ELNIBZZ} + \text{ELISBZZ}$$

$$\text{TETCBUS} = \text{FFTCBUS} + \text{NUETBUS} + \text{RETCBUS} + \text{ELNIBUS}$$

Total Energy Consumption by End-Use

Total energy consumption for each of the four end-use sectors (residential, commercial, industrial, and transportation) is the sum of all energy sources consumed by the sector. Each sector total includes retail sales of electricity, which is produced from other primary energy sources, and electrical system energy losses, which are allocated to the end-use sectors based on electricity sales.

Energy sources are presented as they are consumed; that is, natural gas includes supplemental gaseous fuels that are commingled with the natural gas, and petroleum products include fuel ethanol that is blended into motor gasoline.

In general, total energy consumed by the four end-use sectors by State and for the United States as a whole include the following:

- coal (CL)
- natural gas (NG), which includes supplemental gaseous fuels
- all petroleum products (PA), which includes fuel ethanol blended into motor gasoline
- geothermal direct use energy and geothermal heat pumps (GE)
- conventional hydroelectric power (HY)
- solar thermal direct use energy and photovoltaic electricity net generation (SO)
- wood (WD)
- biomass waste (WS)
- electricity sales (ES)
- electrical system energy losses (LO)

Prior to 1993, motor gasoline data from the source do not include fuel ethanol, so fuel ethanol (EN) is added to the total consumption calculation from 1960 through 1992. (Fuel ethanol data before 1981 are not available and are assumed to be zero.)

To prevent double counting of supplemental gaseous fuels (SF), which are accounted for as part of the fossil fuels from which they are derived, and also as part of natural gas, supplemental gaseous fuels are removed from total energy for the residential, commercial, industrial, and electric power sectors.

Specific details for each of the end-use sectors are described below.

Residential Sector

Solar thermal direct use energy and photovoltaic electricity net generation for the residential and commercial sectors combined (SOHCB) is included only in the residential sector because the individual sector use cannot be identified:

$$\text{TERCB} = \text{CLRCB} + \text{NGRCB} + \text{PARCB} + \text{GERCB} + \text{SOHCB} + \text{WDRCB} + \text{ESRCB} + \text{LORCB} - \text{SFRCB}$$

Commercial Sector

From 1960 through 1992:

$$\text{TECCB} = \text{CLCCB} + \text{NGCCB} + \text{PACCB} + \text{ENCCB} + \text{GECCB} + \text{HYCCB} + \text{WDCCB} + \text{WSCCB} + \text{ESCCB} + \text{LOCCB} - \text{SFCCB}$$

From 1993 forward:

$$\text{TECCB} = \text{CLCCB} + \text{NGCCB} + \text{PACCB} + \text{ESCCB} + \text{GECCB} + \text{HYCCB} + \text{WDCCB} + \text{WSCCB} + \text{LOCCB} - \text{SFCCB}$$

Industrial Sector

The industrial sector includes energy losses and co-products from the production of fuel ethanol (ENLCB). It includes net imports of coal coke (CCNIBUS) in the U.S. total but not in the individual State estimates because no reliable means of allocating the U.S. amount to the States has been developed.

From 1960 through 1992:

$$\text{TEICBUS} = \text{CLICBUS} + \text{CCNIBUS} + \text{NGICBUS} + \text{PAICBUS} + \text{ENICBUS} + \text{ENLCBUS} + \text{GEICBUS} + \text{HYICBUS} + \text{WDICBUS} + \text{WSICBUS} + \text{ESICBUS} + \text{LOICBUS} - \text{SFIBUS}$$

$$\text{TEICBZZ} = \text{CLICBZZ} + \text{NGICBZZ} + \text{PAICBZZ} + \text{ENICBZZ} + \text{ENLCBZZ} + \text{GEICBZZ} + \text{HYICBZZ} + \text{WDICBZZ} + \text{WSICBZZ} + \text{ESICBZZ} + \text{LOICBZZ} - \text{SFIBZZ}$$

From 1993 forward:

$$\text{TEICBUS} =$$

$$\text{CLICBUS} + \text{CCNIBUS} + \text{NGICBUS} + \text{PAICBUS} + \text{ENLCBUS} + \text{GEICBUS} + \text{HYICBUS} + \text{WDICBUS} + \text{WSICBUS} + \text{ESICBUS} + \text{LOICBUS} - \text{SFINBUS}$$

$$\text{TEICBZZ} = \text{CLICBZZ} + \text{NGICBZZ} + \text{PAICBZZ} + \text{ESICBZZ} + \text{GEICBZZ} + \text{HYICBZZ} + \text{WDICBZZ} + \text{WSICBZZ} + \text{LOICBZZ} + \text{ENLCBZZ} - \text{SFINBZZ}$$

Transportation Sector

From 1960 through 1992:

$$\text{TEACB} = \text{CLACB} + \text{NGACB} + \text{PAACB} + \text{ENACB} + \text{ESACB} + \text{LOACB}$$

From 1993 forward:

$$\text{TEACB} = \text{CLACB} + \text{NGACB} + \text{PAACB} + \text{ESACB} + \text{LOACB}$$

The sum of total energy consumed by the four end-use sectors should equal total energy consumption calculated by summing all energy sources. As a cross-check that is not used in the report tables, the sum of the consumption by the four end-use sectors for each State and U.S. total is also calculated in SEDS:

$$\text{TESSB} = \text{TERCB} + \text{TECCB} + \text{TEICB} + \text{TEACB}$$

The slight discrepancies between TESSB and TETCB are caused by independent rounding of the components.

Total Net Energy

A set of totals is calculated to estimate consumption in the four major end use sectors excluding each sector's share of all electrical system energy losses that are incurred in the generation, transmission, and distribution of electricity. This series is total net energy consumed and is represented by "TN."

Total net energy consumed by the residential, commercial, industrial, and transportation sectors are calculated:

$$\text{TNRCB} = \text{TERCB} - \text{LORCB}$$

$$\text{TNICB} = \text{TEICB} - \text{LOICB}$$

$$\text{TNCCB} = \text{TECCB} - \text{LOCCB}$$

$$\text{TNACB} = \text{TEACB} - \text{LOACB}$$

Total Energy Consumed per Capita

The energy consumed per person residing in each State and in the United States is estimated by dividing the total energy series ("TE") by the resident population as published by the U.S. Department of Commerce, Bureau of the Census. The U.S. total population may be revised more frequently than the State population estimates, so the sum of the available States' population data may not equal the U.S. totals. Therefore, the U.S. total population is input into SEDS instead of being calculated as the sum of the States' values. The variable names for the series are ("ZZ" in the variable name represents the two-letter State code that differs for each State):

TPOPPZZ = resident population of each State; and

TPOPPUS = resident population of the United States.

Estimated energy consumption per capita for each State and the United States, in million Btu, is represented by "TETPB" and is calculated:

$$\text{TETPB} = \text{TETCB} / \text{TPOPP}$$

The residential, commercial, industrial, and transportation sectors' energy consumption per capita are estimated:

$$\text{TERPB} = \text{TERCB} / \text{TPOPP}$$

$$\text{TECPB} = \text{TECCB} / \text{TPOPP}$$

$$\text{TEIPB} = \text{TEICB} / \text{TPOPP}$$

$$\text{TEAPB} = \text{TEACB} / \text{TPOPP}$$

Data Sources

TPOPPUS — Resident population of the United States. July 1 estimates for all years.

- 1960 through 1989: U.S. Department of Commerce, Bureau of the Census <http://www.census.gov/popest/archives/1990s/popclockest.txt>.
- 1990 through 1999: U.S. Department of Commerce, Bureau of the Census, Internet Release http://www.census.gov/popest/archives/2000s/vintage_2001/CO-EST2001-12/.
- 2000 forward: <http://www.census.gov/popest/states/NST-ann-est.html>.

TPOPPZZ — Resident population by State. July 1 estimates for all years.

- 1960 and 1970: U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States, 1980*, Section 1 Population, "No. 10. Resident Population--States: 1950 to 1979".
- 1980: U.S. Department of Commerce, Bureau of the Census, <http://www.census.gov/popest/archives/1980s/s5yr8090.txt>.
- 1960 through 1989: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports*, "Population Estimates and Projections," Series P-25. Specific publication numbers and table numbers:
 - 1961 through 1969: Number 460, Table 1.
 - 1971 through 1979: Number 957, Table 4.
 - 1981 through 1989: Number 1058, Table 3.
- 1990 through 1999: U.S. Department of Commerce, Bureau of the Census, Internet Release http://www.census.gov/popest/archives/2000s/vintage_2001/CO-EST2001-12/index.html.
- 2000 forward: <http://www.census.gov/popest/states/NST-ann-est.html>.

Total Energy Consumed per Real Dollar of Gross Domestic Product

Total energy consumed per chained (2000) dollar of output by State and the United States is estimated by dividing the total energy series ("TE") by real gross domestic product (GDP) as published by the U.S. Department of

Commerce, Bureau of Economic Analysis, beginning in 1977. The U.S. real GDP is extracted from the same data source as the State data. This series does not match the national account GDP series. For details, see BEA Regional Economic Accounts: Methodologies, <http://www.bea.gov/regional/methods.cfm>.

For 1977 through 1989, BEA does not provide the real GDP by State estimates. However, BEA's quantity indexes for real GDP by State (2000=100.000) are used to calculate real GDP from 1977 to 1989. For 1990 through 1996, BEA reports real GDP by State based on the Standard Industrial Classification (SIC). For 1997 forward, BEA reports real GDP by State based on the North American Industry Classification System (NAICS). Given this discontinuity in the GDP by States series at 1997, users of these data are strongly cautioned against appending the two data series in an attempt to construct a single time series of GDP by State estimates.

The variable names for the series are ("ZZ" in the variable name represents the two-letter State code that differs for each State):

GDPRXUS = real gross domestic product of the United States in million chained (2000) dollars.; and

GDPRXZZ = real gross domestic product by State in million chained (2000) dollars.

Estimated energy consumption per real chained (2000) dollar for each State and the United States, in thousand Btu per chained (2000) dollar, is represented by "TETGR" and is calculated:

$$\text{TETGR} = \text{TETCB} / \text{GDPRX}$$

Data Sources

GDPRXUS — Real gross domestic product of the United States in million chained (2000) dollars.

- 1977 through 1996: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=SIC>.

- 1997 forward: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=NAICS>.

GDPRXZZ — Real gross domestic product by State in million chained (2000) dollars.

- 1977 through 1996: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=SIC>.
- 1997 forward: U.S. Department of Commerce, Bureau of Economic Analysis, <http://www.bea.gov/regional/gsp/default.cfm?series=NAICS>.